SCastellano_Job_1_of_1

Printed by HPS Server

for

EAST

Printer: cp2_9b19_gbksptr

Date: 09/11/03

Time: 14:45:10

Document Listing

Document	Selected Pages	Page Range	Copies
WO009856660	43	1 - 43	1
Total (1)	43	-	-

12 sheets
18 Fig.

PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : B65B 3/02 — A2

(11) International Publication Number: WO 98/56660

(43) International Publication Date: 17 December 1998 (17.12.98)

(21) International Application Number: PCT/EP98/03419

(22) International Filing Date: 8 June 1998 (08.06.98)

(30) Priority Data:
MO97A000106 9 June 1997 (09.06.97) IT

(71) Applicant *(for all designated States except US)*: UNIFILL INTERNATIONAL AG [CH/CH]; Hauptstrasse 14, CH–8280 Kreuzlingen (CH).

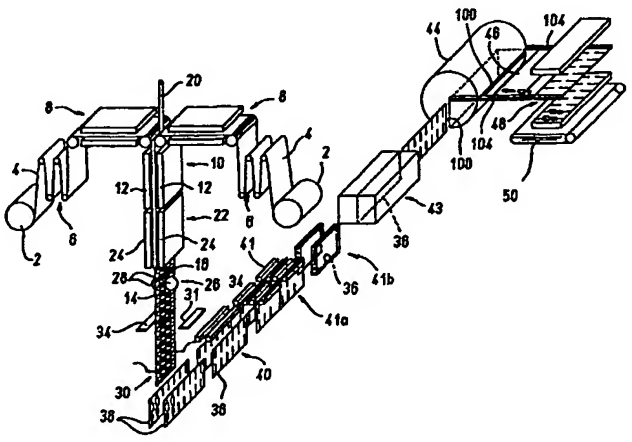
(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: BARTOLI, Andrea [IT/IT]; Via Victor Hugo, 23, Fraz. Canali, I–42100 Reggio Emilia (IT). TRALDI, Flavio [IT/IT]; Via Verdeta, 78, I–41030 S. Prospero (IT).

(74) Agent: LUPPI, Luigi; Luppi & Crugnola S.r.l., Viale Virgilio, 56/f, I–41100 Modena (IT).

(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published
Without international search report and to be republished upon receipt of that report.

(54) Title: METHOD AND APPARATUS FOR MAKING AND ADVANCING GROUPS OF CONTAINERS



(57) Abstract

A method comprises advancing strips parallely to each other along a path extending longitudinally of the strips, heat–welding together and thermo–forming said strips to form containers aligned longitudinally in groups side–by–side in pairs of groups along said strips, severing said strips transversely between the pairs of groups, and filling and sealing the containers in the groups; relative turning of the groups of each pair of groups is produced through substantially 180° to orient upwardly inlets of all of the containers of the two groups of each pair, and subsequently the containers are filled and sealed; apparatus comprises blow–thermoforming means to form containers aligned in rows from a pair of thermoplatic strips, turning means arranged to produce relative turning of groups of formed containers through substantially 180° to orient upwardly inlets of the containers, advancing means arranged to advance the strips parallely to each other along a path extending longitudinally of the strips, severing means arranged to sever said strips transversely between the pairs of groups, and filling and sealing means arranged to fill and seal the containers in the groups.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Paso	GR	Greece			TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	NZ	New Zealand		
CM	Cameroon			PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

METHOD AND APPARATUS FOR MAKING AND ADVANCING GROUPS OF CONTAINERS

This invention relates to a method and apparatus for forming and possibly filling and sealing containers, a method and apparatus for advancing containers, a method and apparatus for transferring units, and a clamping apparatus and method.

In EP-A-0019005 a method for the production of suppository cells is disclosed, in which two continuous strips of thermoplastics are joined and the outlines of the cells are made by welding with the cells being arranged in pairs of groups, the groups in each pair being arranged side-by-side along the strips, and the cells in each group being arranged in a row extending along the strips. After storage and transportation in the flat, final shaping of the cells is sffected. The apparatus for carrying out the latter part of the method includes a horizontal pre-heating station, followed by a horizontal final shaping mould where the cells are shaped by blow-thermoforming; with the concurrent action of suction and and blowing devices to keep the shells in the proper shape the two dies of the mould die are displaced rectilinearly towards and away from each other. This system allows storage and transportation of the semi-finished shells in the flat, which are then finally shaped at the plant where the suppositories are prepared. After filling and sealing, the strips are severed centrally to separate the group of each pair and then severed transversely to separate the groups from each other.

EP-A-0487788 discloses a method for producing a band of two parallel rows of containers of flexible material arranged in pairs with opposed apertures and joined by a centre strip. The outlines of the containers are formed by welding and the containers in each row are almost separated from each other by slits. After production, the band of containers may be wound in the form of a coil, or concertina folded up in boxes, for the containers to be successively utilized by being pulled open, filled, sealed, and then separated from each other.

In EP-A-0692428, a group of containers in thermoformable and

heat-weldable material includes an inlet comprising inlet wall portions which are elastic so that the inlet is self-closing prior to permanent sealing. A blow-thermoforming system for the manufacture of such groups of containers from two face-to-face strips of material comprises a forming station for forming pairs of groups of containers, a severing station for severing the strips transversely to separate the pairs from each other centrally along a central inflation tunnel, a turning station for turning each pair through a right-angle in the plane of the pair, a first filling station downstream of the turning station for filling one group of a pair, a first sealing station for sealing that group, an inverting station for inverting that pair, a second filling station for filling the other group of that pair, and a second sealing station for sealing that other group.

It is also known to employ clamps to grip edge zones of sheet material, for example to advance it at the various working stations, in particular in machines for utilizing plastic film.

Such clamps comprise gripping jaws which grip the sheet material along localized parts of the edge zones, but unfortunately produce therein permanent deformations, or even perforations, or lacerations, this rendering substantially useless such edge zones in subsequent working and therefore causing the production of scrap at the edges of the sheet material.

The localized action of the jaws is particularly damaging when there are used sheet materials which are heated for working proposals and, for this reason, have a low mechanical resistance and thus easily vulnerable to the action of the clamps.

According to first aspect of the present invention, there is provided a method comprising advancing strips parallelly to each other along a path extending longitudinally of the strips, heat-welding together and thermo-forming said strips to form containers arranged in groups side-by-side in pairs of groups along said strips, with the containers in each group being arranged in a row extending along said strips and with

the rows in each pair of groups extending substantially parallelly to each other, severing said strips transversely between the pairs of groups, and filling and sealing the containers in the groups, characterized by producing relative turning of the groups of that pair of groups through substantially 180° to bring inlets of all of the containers of the two groups of each pair into a condition in which they open upwards, and subsequently performing said filling and said sealing for substantially all of the containers of that pair of groups.

According to a second aspect of the present invention, there is provided apparatus comprising advancing means arranged to advance strips parallelly to each other along a path extending longitudinally of the strips, heat-welding and thermo-forming means arranged to heat-weld together and thermo-form said strips to form containers arranged in groups side-by-side in pairs of groups along said strips, with the containers in each group being arranged in a row extending along said strips and with the rows in each pair of groups extending substantially parallelly to each other, severing means arranged to sever said strips transversely between the pairs of groups, and filling and sealing means arranged to fill and seal the containers in the groups, characterized by turning means arranged to produce relative turning of the groups of each pair of groups through substantially 180° to bring inlets of the containers of each group into a condition in which they open upwards, said filling and sealing means being located after said turning means and serving to perform the filling and the sealing for substantially all of the containers of each pair of groups.

Owing to these aspects of the invention, it is possible to increase the rate of production of the containers without significant additional expenditure on the apparatus.

The rows of each groups may be formed from a respective separate pairs of strips, or they may be formed from a single pair of strips which is severed longitudinally between the rows of

each group. The containers of each row may be blow-thermoformed from centrally of the rows of each pair of groups or from the outer edges of the rows of each pair of groups.

Owing to these aspects of the invention, it is additionally possible to minimize scrap material produced by the system.

According to a third aspect of the present invention, there is provided a method comprising indexing containers along separate first and second paths substantially parallel to each other past pairs of stations whereof the stations of each pair are associated with the respective paths, in such manner that the indexing of the containers along the first path is out of phase with the indexing of the containers along the second path, characterized by supplying the containers to the paths in the form of units each comprised of a group of the containers anchored to each other and arranged in a row to extend along the path.

According to a fourth aspect of the present invention, there is provided apparatus comprising first and second indexing conveyors arranged to index containers along respective separate first and second paths substantially parallel to each other, pairs of stations whereof the stations of each pair are associated with the respective paths and past which the indexing conveyors advance the containers in such manner that the indexing of the containers along the first path is out of phase with the indexing of the containers along the second path, characterized by supplying means arranged to supply the containers to the paths in the form of units each comprised of a group of the containers anchored to each other and arranged in a row to extend along the path.

Owing to these aspects of the invention, it is possible to reduce the peak loads on the drive system for the conveyors and the pairs of stations handling groups of containers from, for example, a blow-thermoforming arrangement.

According to a fifth aspect of the present invention, there is provided a method comprising advancing containers along separate first and second paths substantially parallel to each

other past pairs of stations whereof the stations of each pair are associated with the respective paths, and thence along a common, third path, characterized by supplying the containers to the first and second paths in the form of units each including a group of the containers anchored to each other, and cutting the containers of each unit from the unit at a cutting station past which the third path extends.

According to an sixth aspect of the present invention, there is provided apparatus comprising first and second conveying means arranged to advance containers along separate first and second paths substantially parallel to each other, pairs of stations whereof the stations of each pair are associated with the respective paths and past which the first and second conveying means advance the containers, and third conveying means for receiving the containers from both of the first and second paths and advancing the received containers along a common, third path, characterized by supplying means arranged to supply the containers to the first and second paths in the form of units each including a group of the containers anchored to each other, and a cutting station past which the third path extends and whereat the containers of each unit are cut from the unit.

Owing to these aspects of the invention, it is possible to improve the efficiency of the cutting station compared with an arrangement in which there are first and second cutting stations in the respective first and second paths.

According to a seventh aspect of the present invention, there is provided a method comprising providing a slot extending in a first plane, introducing into said slot a sheet material unit so that the unit extends generally in said plane, turning said slot and thus said unit about an axis of turning lying substantially in said plane, said unit then leaving said slot.

According to an eighth aspect of the present invention, there is provided apparatus comprising a slot extending in a first plane for receiving a sheet material unit so that the unit extends generally in said plane, turning means arranged to

turn said slot and thus said unit about an axis of turning lying substantially in said plane, and removing means arranged to remove said unit from said slot.

Owing to these aspects of the invention, it is possible to provide a very simple system for bringing a substantially horizontal row of containers from a vertical orientation to a horizontal orientation in preparation for e.g. cutting-out of the containers.

According to a ninth aspect of the present invention, there is provided apparatus comprising first and second pre-heating stations arranged at substantially the same horizontal level as each other for pre-heating respective thermoplastics strips extending therethrough, a shape-initiating station located below said horizontal level for initiating shapes of containers to be produced from said strips, first and second mould dies of said shape-initiating station displaceable towards and away from each other, and oscillatory driving means connected to said first and second mould dies and arranged to drive the dies towards and away from each other, characterized in that, said dies are arranged substantially vertically and are displaceable rectilinearly and substantially horizontally towards and away from each other, and in that said driving means is arranged to drive the dies rectilineraly towards and away from each other.

Owing to this aspect of the invention, it is possible not only to have the evenness of heating and compactness obtainable from horizontally arranged pre-heating stations, but also to have simple guiding and driving of dies of the shape-initiating station.

The shape-initiating station could be an outline-welding station, an outline-welding and full-forming station, an outline-welding and partial-forming station, or a partial- or full-forming station, for the containers.

It is desirable to improve the known clamps for sheet material, in particular to produce clamps for sheet material wherein a safe gripping of edge zones of the material, without

substantially damaging them, is possible.

According to a tenth aspect of the present invention, there is provided a method for clamping sheet material at an edge part by clamping means, comprising operating said clamping means, characterized by displacing operating fluid at a deformable means of said clamping means and thereby deforming said deformable means.

According to an eleventh aspect of the present invention, there is provided clamping apparatus for sheet material, comprising clamping means suitable for clamping an edge part of said material and releasing said edge part, characterized in that said clamping means comprises means deformable under the action of an operating fluid.

Owing to these aspects of the invention, it is possible to clamp sheet material at edge zones of it without substantially damaging those zones.

The deformable means may extend for a considerable length along an edge zone of sheet material and therefore the action of the clamp on the material may be distributed over a correspondingly high surface area, thereby reducing the risk of permanent deformation of the material owing to concentrated gripping actions. This is particularly desirable when the sheet material is particularly soft.

Furthermore the clamping means may be entirely included within a clamp body and, therefore, the whole structure may be very compact.

In order that the invention may be clearly understood and readily carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:

- Figure 1 is a diagrammatic perspective view from one end of a system for producing filled and sealed containers;
- Figure 1a is an elevation of a length of blow-thermoformed strips at a stage in the system;
- Figure 2 is a diagrammatic plan view of the system;
- Figure 3 is a diagrammatic, fragmentary, partly sectional end elevation of two preheating stations and a sealing and

partial forming station of the system;

- Figure 4 is a diagrammatic, fragmentary, partly sectional end elevation of a transverse severing and right-angle turning station of the system;
- Figure 5 is a diagrammatic, fragmentary, top plan view, partly in section on the line V-V of Figure 4;
- Figure 6 shows a section taken on the line VI-VI of Figure 2;
- Figure 7 is a diagrammatic, fragmentary, partly sectional, end view taken in the direction of the arrow VII in Figure 2 and illustrating a transfer apparatus of the system;
- Figure 8 is a diagrammatic, fragmentary, top plan view of the transfer apparatus;
- Figure 9 is a detail of Figure 8;
- Figure 10 shows a section taken on the line X-X of Figure 9, with a clamping device open;
- Figure 11 is a view corresponding to Figure 10, but with the clamping device closed;
- Figure 12 is a view corresponding to Figure 10 of a modified version of the clamping device;
- Figure 13 is a view corresponding to Figure 11 of the modified version;
- Figure 14 is a diagrammatic, fragmentary, top plan view of a shuttle station of the system;
- Figure 15 is a section taken on the line XV-XV of Figure 14; and
- Figure 16 is a side elevation of the shuttle station.

Referring to Figures 1 and 2, the system comprises two reels 2 from which respective strips 4 of thermoplastics are indexed through respective detensioning stations 6 and respective preheating stations 8 to a welding and partial forming station 10 common to both strips 4. The strips 4 travel through the pre-heating stations 8 in respective horizontal conditions and approach the station 10 in respective vertical conditions parallel to each other.

The station 10 comprises respective mould dies 12 displaceable

rectilinearly horizontally towards and away from each other by horizontal rectilinear driving devices 13 (see Figure 3) to weld the strips 4 together around the outlines of respective potential containers 14 and vertically and horizontally to define a central, vertical, inflation tunnel 16 with horizontal branch inflation tunnels 18 extending from the inflation tunnel 16 to the potential containers 14. Extending downwardly to between the upper parts of the dies 12 is a compressed air supply pipe 20 which supplies inflation air to the upper end of the tunnel 16 and thence through the branch tunnels 18 to the potential containers 14 in order partially to form the containers. The station 10 partially forms simultaneously a pair of groups of containers 14, with the containers of each group forming a row of containers extending longitudinally of the strips 4. The strips 4 are then indexed to a final forming station 22 including two mould dies 24 in which the containers 14 are finally formed by inflation air supplied through the tunnel 16. The strips 4 are then indexed through a longitudinal severing station 26 at which a pair of rotary knives 28 sever the strips 4 along their vertical centreline and thereby cut the tunnel 16 into two identical channels. The two halves of the strips are then indexed to a transverse severing and right-angle turning station 30 where the two halves of the strips are gripped by respective gripping devices 32 (see Figure 5), then the two rows of containers at the station 30 are transversely severed from the following rows by transverse, reciprocatory knives 34 to provide respective units 36 including the respective rows. The units of each pair of units 36 are then displaced in opposite directions perpendicular to the vertical plane of the strips 4 by the gripping devices 32 into respective planes parallel to that vertical plane and equidistantly spaced therefrom, and are turned through 90° in respective opposite senses in those respective planes to bring their respective channels into upwardly opening conditions. The units 36 are then indexed horizontally along respective parallel paths 38 in a manner 180° out-of-phase with each ot-

her. On these paths they enter respective stations of a pair of filling stations 40 where the containers 14 are filled with product through the inlets constituted by the branch tunnels 18, then enter respective stations of a pair of heating and sealing stations 41, where the walls of the channels are displaced inwards and sealed to each other, then enter respective stations of another pair of heating and sealing stations, where the walls of the inlets are partially displaced towards each other, then enter respective stations of a further pair of heating and sealing stations 41a, where the walls of the inlets are displaced into contact with each other and finally sealed together, and then enter respective stations of a pair of cooling stations 41b, where the channel and inlets zones are cooled. Beyond the cooling stations 41b is a transfer station 43, where the filled and sealed units 36 are transfered back into the vertical plane of the strips 4 by a shuttle mechanism 43, onto a common, third path 42 along which they are indexed into a rotary transfer device 44 which turns the units 36 from their vertical plane into a horizontal plane. The units 36 are then forwarded by a linear transfer device 46 to a cutting station 48 where the individual containers 14 are cut from their units 36 and drop onto a delivery conveyor 50. Immediately before the paths 38 is a reject conveyor 51, whereby, if there is an interruption of normal operation along or beyond the paths 38, the units 36 can continue to be produced but delivered by the conveyor 51, for filling and sealing once the interruption has been rectified. The reject conveyor 51 is similarly useful at start-up of the system.

Since the parts of the apparatus from the reels 2 to the shuttle mechanism 43 are substantially symmetrical about a vertical central plane, in Figures 3 to 5 only one half of the relevant parts are fully shown.

Figure 3 shows the preheating stations 8 and the welding and partial forming station 10 with its two dies 12. Each station 8 includes an upper heating block 52 which contains electrical heating elements 53 and which normally occupies the position

shown in the Figure, except when the system is not in operation, when the block 52 is swung away upwards to prevent overheating of the upper surface of the strip 4. Each station 8 also includes a lower heating block 54 which contains further electrical heating elements 53 and which is turnable about the horizontal axis of rotation 56 of a horizontal roller 58 which guides the strip 4. The block 54 is turned about that axis by an oscillating fork 60, in such a manner that the block 54 presses the strip 4 against the heating block 52 between indexing movements of the strip and swings the block 54 away from the block 52 preparatory to each indexing movement of the strip.

Referring to Figure 4, there are seen the knives 34 which are horizontally reciprocated towards and away from each other by respective plungers 62 guided in sleeves 64 and driven by respective cam-and-follower devices 66. Referring also to Figure 5, each gripping device 32 includes two jaws 68 and 70, of which the jaw 68 is fixed to the inner end of a horizontal rod 72 and of which the jaw 70 is fixed to the inner end of a horizontal sleeve 74 co-axial with the rod 74. A pin-in-slot arrangement 76 prevents rotation of the rod 72 and the sleeve 74 relative to each other, but allows a limited degree of movement of the rod 72 along the sleeve 74 to permit gripping and release of the units 36 by the jaws 68 and 70. Each sleeve 74 is co-axial with a camming sleeve 78 fast with a fixed frame 79 and has fixed radially thereto a camming pin 80 guided in a camming slot 82 in the sleeve 78. Each sleeve 74 is axially reciprocable by a co-axial ring 84 mounted thereon by way of a ball bearing 86, the ring 84 being axially displaceable by way of a linkage 88 itself driven by a cam-and-follower device 90. Axial reciprocation of the sleeve 74 and thus the rod 72 produces 90° turning of the gripping device 32 (from the position shown in full lines in Figure 4 to the position shown in dot-dash lines in that Figure) about the horizontal axis of the rod 72 and the sleeve 74, owing to the effect of the cam arrangement 78, 79, 80 and 82. Axial di-

splacement of the rod 72 relative to the sleeve 74 is produced by a small, pneumatic, piston-and-cylinder device 92 at the outer ends of the rod 72 and the sleeve 74. On arrival in the dot-dash position shown in Figure 4, the device 92 is operated to cause the jaws 68 and 70 to release the unit 37, whereupon a horizontally reciprocable pusher 91 pushes the unit onto the path 38. The reject conveyor 51 is a belt conveyor driven from a speed reducer 93; when rejection is to occur, the pushers 91 and the gripping devices 32 are rendered inoperative, so that the units 36 fall onto the conveyor 51.

Referring to Figure 6, the units 36 are guided along the paths 38 by guide channels (not shown) and each unit is forwarded along its paths 38 by forwarding devices 94, each of which pushes the unit along the path, then swings out of the path about a horizontal axis 95, is retracted back along the path, and is swung back into the path about the axis 95 ready to advance the next unit.

Referring to Figure 7, the units 36 are advanced along the path 42 to the rotary transfer device 44 by a belt-and-pushers conveyor 96. Each unit 36 arrives at the rotary transfer device 44 in a condition in which the unit extends in a vertical plane containing a horizontal axis of rotation 97 of the device 44. The device 44 includes radiating pairs of vanes 98 extending in longitudinal planes parallel to the axis 97 and providing respective slots 100 extending along the device 44 and serving to receive the units 36 at their inner ends, where their vanes 98 provide lead-in narrowings. Formed longitudinally of the device 44 in the base of each slot 100 is a slit 101 for receiving a top fin of each unit 36. The device 44 is indexed round its axis 97 in phase with the arrival of a unit 36 at its lowermost slot 100 and carries the units to an exit position 102 where the unit has turned through 270° around the axis 97 into a horizontal plane containing the axis 97. The ends of each unit 36 protrude from the respective ends of the slot 100 and, at the position 102, are clamped by respective clamping devices 104 (see Figure 8) of the linear transfer

device 46 and the unit is advanced stepwise to the cutting station 48.

As seen in Figure 8, the clamping devices 104 extend parallelly to each other along respective opposite edges of a perforated, horizontal plate 106, the perforations 108 through which are arranged in transverse rows each corresponding to a row of containers 14 in a unit 36 and receive and locate the lower parts of the containers between stepwise advances of the unit by the clamping devices 104. Having clamped the ends of the unit 36 at the position 102 and the ends of the other units (not shown in Figure 8) on the plate 106, and after lowering of the plate 106 by supporting, pneumatic piston-and-cylinder devices (of which one is seen in Figure 7 and referenced 110), the clamping devices 104 advance the units 36 by one pitch, the leading unit 36 entering the cutting station 38, and the lagging unit 36 leaving the position 102. The piston-and-cylinder devices such as 110 then lift the plate 106 back in its position shown in Figure 7 and the clamping devices 104 release the units 36, and move directly outwardly away from each other. Then the device 44 is indexed to bring the next unit 36 into the position 102, the devices 104 are retracted back towards the axis 97, return directly inwardly towards each other and then clamp the ends of the units 36 at the position 102 and in the plate 106.

As shown in Figures 9 to 11, each clamping device 104 is formed by a first member 112 and a second member 114 interconnetted to each other by connecting screws 116, and is provided, on the side facing the unit 36, with an opening 118 to receive an edge zone of the unit 36.

The opening 118 is defined between a first surface 120 of the first member 112 and a second surface 122 of the second member 114, the surfaces 120 and 122 diverging away from each other towards the middle of the unit 36.

The first member 112 is provided with a first cavity 124, extending longitudinally substantially parallelly to the edge zone and substantially for the whole longitudinal extension of

the first member, wherein there is lodged a rigid jaw 126 which has a projection 128 extending longitudinally thereof and having a longitudinal bottom surface 130 received inside a second cavity 132 correspondingly provided in the second member 114. The jaw 126 perform limited movements inward and outward with respect to the first cavity 124 and, correspondingly outward and inward with respect to the second cavity 132, because it is inserted with a certain play into the cavities themselves.

The movements of the jaw 126 are controlled by a first tubular body 134, inserted into a first channel 136 included in the base of the first cavity 124 and acting on an upper surface 138 of the jaw 126 parallel and opposite to the bottom surface 130, and by a second tubular body 140, inserted into a second channel 142 included in the base of the second cavity 132.

The tubular bodies 134 and 140 are made of deformable and inflatable material and contain a fluid operating medium, for example compressed air.

Therefore, when the clamp is to be brought in its open condition (Figure 10), the second tubular body 140 is inflated, through a solenoid valve (not shown), with compressed air and the jaw 126 moves up inwardly with respect to the first cavity 124 to stop on the base thereof. In this way, the jaw 126 squashes the first tubular body 134, which has been suitably connected to an outlet for the compressed air, inside the channel 136. On the other hand, when the unit 36 has to be gripped, pressurized air is supplied into the first tubular body 134, which displaces the jaw 126 outwards with respect to the first cavity 124 to clamp the unit 36 against an internal abutting surface 144 of the second member 114 by means of an appendix 146 of the jaw 126. In such condition, shown in Figure 11, the second tubular body 140 is connected to the outlet for the compressed air and elastically retracts inside the channel 142.

The provision of the tubular bodies 134 and 140 allows the application of a load distributed in a substantially uniform

manner along the length of the jaw 126, so as to allow a safe gripping while maintaining very low the pressure on the edge zones of the unit 36.

As shown in Figures 12 and 13, in a further embodiment the clamp comprises a first member 112a and a second member 114a between which there is interposed a mobile jaw 126a, which is acted upon by the first tubular body 134 from one side and, from the opposite side, by return spring means 148 inserted into a seat 150 provided in the second member 114a. Between the spring means 148 and the jaw 126a there is interposed a cap 152, wherein one of the ends of the spring means 148 is received, and which is axially slidably lodged partly in the seat 150 and partly in a recess 154 in the jaw 126a.

When the clamp has to be closed, a pressurized fluid is supplied to the first tubular body 134, which displaces the jaw 126a towards the second member 114a, so clamping the unit 36 against it, while the spring 148 is compressed, making the case 152 move further into the seat 150. To free the unit 36, the pressure of the operating fluid in the first tubular body 134 is lowered, so that the spring 148 may return into its initial position displacing the jaw 126a away from the unit 36 and squashing the first tubular body 134 in the channel 136. The stroke of the jaw 126 or 126a is very short, this allowing a very rapid driving of the clamp.

The device 104 is applicable to a range of situations, for example may be stationary, or is advantageously coupled with driving means, not shown, so as to allow the stepwise pulling of sheet material, such as the unit 36, in the longitudinal direction indicated by the arrow F. To obtain indexing of the sheet material, the device 104 closes on an edge zone, while on the opposite edge an anologous device may close, and the device(s) 104 is/are moved by the driving means, in the direction F to displace the sheet material by a step of predetermined length. Afterwards, the device(s) 104 is/are opened and, leaving the sheet material at the position so reached, brought back to the start position, ready to close again on

(a) further edge zone(s) of the sheet material to produce a further displacement, when required.

In an embodiment not shown, one, or both, of the tubular bodies 134 and 140 act(s) directly on the sheet material, i.e. itself of themselves act(s) as a jaw or pair of jaws.

As shown in Figures 14 to 16, the shuttle station 43 has an entry 432 through which the units 36 indexed out of phases along the paths 38 are delivered to a pair of pockets 434 which transfer the units to the common, third path 42.

The pockets 434 extend parallely to the paths 38 and 42 and project downwardly from a sliding member 435 which is slidably mounted on a pair of guide members 436 extending transversely to the paths 38 and 42.

The sliding member 435 is reciprocally driven along the guide members 436 via an oscillating lever 438 which is pivoted on a pin 440 at an intermediate position between the paths 38 and is operable by a cam arrangement 442 comprising a linear driving member 443, so that each pocket 434 is displaced from a first position in which the pocket is aligned with the first or the second path 38 to a second position in which the same pocket is aligned with the third path 42. The arrangement is such that, when one of the pockets 434 is aligned with the first or second path 38, the other pocket is aligned with the third path 42, thus delivering the unit 36 to belt conveyor means 444 which extend below the pockets 434 and are provided with pushing teeth 446 projecting towards the units 36 and by which the units 36 are extracted one at a time and advanced along the common path 42.

The cam arrangement 442 comprises a cam-operated bell-crank lever 448 pivoted on a longitudinal shaft 452 and having a first end connected to the linear driving memeber 443 and a second end provided with a cam follower 450. The linear driving member 443 is also connected to a return spring 454.

CLAIMS

1. A method comprising advancing strips parallelly to each other along a path extending longitudinally of the strips, heat-welding together and thermo-forming said strips to form containers arranged in groups side-by-side in pairs of groups along said strips, with the containers in each group being arranged in a row extending along said strips, and with the rows in each pair of groups extending substantially parallelly to each other, severing said strips transversely between the pairs of groups, and filling and sealing the containers in the groups, characterized by producing relative turning of the groups of each pair of groups through substantially 180° to bring inlets of all of the containers of the two groups of each pair into a condition in which they open upwards, and subsequently performing said filling and said sealing for substantially all of the containers of each pair of groups.

2. A method according to claim 1, wherein said relative turning consists of turning the groups of each pair of groups through respective right-angles.

3. A method according to claim 1 or 2, and further comprising, before said relative turning, displacing the groups of each pair of groups relative to each other to cause the groups of each pair of groups to come to extend in respective planes substantially parallel to each other.

4. A method according to claim 3, wherein, after said displacing, the groups of each pair of groups are advanced in said respective planes out-of-phase with each other.

5. A method according to claim 4, wherein the groups of each pair of groups are advanced in said respective planes substantially 180° out-of-phase with each other.

6. A method according to any one of claims 3 to 5, and further comprising transferring the groups of each pair of groups from said respective planes to a common plane and subsequently cutting-out the containers from the groups of that pair.

7. A method according any one of claims 1 to 5, wherein, following said filling and said sealing of substantially all of the containers of each pair of groups, the groups are turned from a substantially vertical orientation to a substantially horizontal orientation about ä substantially horizontal axis substantially parallel to the row of each group and are then forwarded substantially horizontally to a cutting station where the containers are cut out.

8. A method according to claim 7, wherein, for the turning of said group from said substantially vertical orientation to said substantially horizontal orientation, said groups are introduced in turn into a slot extending in a substantially vertical plane so that the group therein extends generally in that plane, and said slot and thus the group therein is then turned about said substantially horizontal axis to bring the group to said substantially horizontal orientation.

9. A method according to any preceding claim, and further comprising, between said heat-welding together and thermoforming, on the one hand, and said relative turning, on the other hand, severing said strips along a line extending longitudinally of said strips and between the groups of each pair of groups.

10. A method according to any preceding claim, and further comprising advancing said groups by releasably clamping sheet material at edge zones of the groups by operating releasable clamping means by displacing operating fluid at a deformable means of said clamping means and thereby deforming said deformable means, and advancing said clamping means.

11. A method according to claim 10, wherein said operating of said clamping means comprises displacing said operating fluid into said deformable means to inflate said deformable means.

12. A method according to claim 11, wherein said inflating causes squashing of a second deformable means of said clamping means.

13. A method according to claim 12, wherein said clamping means is released by inflating said second deformable means.

14. A method according to any one of claims 11 to 13, wherein the releasing of said clamping means comprises deflating the first-mentioned deformable means.

15. A method according to claim 10 or 11, wherein said operating of said clamping means comprises displacing said operating fluid to inflate said deformable means and displacing operating fluid to inflate a second deformable means of said clamping means located oppositely to the first-mentioned deformable means.

16. A method according to claim 15, wherein said clamping means is released by deflating the first-mentioned deformable means and said second deformable means.

17. Apparatus comprising advancing means arranged to advance strips parallelly to each other along a path extending longitudinally of the strips, heat-welding and thermo-forming means arranged to heat-weld together and thermo-form said strips to form containers arranged in groups side-by-side in pairs of groups along said strips, with the containers in each group being arranged in a row extending along said strips and with the rows in each pair of groups extending substantially parallelly to each other, severing means arranged to sever said

strips transversely between the pairs of groups, and filling and sealing means arranged to fill and seal the containers in the groups, characterized by turning means arranged to produce relative turning of the groups of each pair of groups through substantially 180° to bring inlets of the containers of each group into a condition in which they open upwards, said filling and sealing means being located after said turning means and serving to perform the filling and the sealing for substantially all of the containers of each pair of groups.

18. Apparatus according to claim 17, wherein said turning means consists of first and second turning means arranged to turn the respective groups of each pair of groups through respective right-angles.

19. Apparatus according to claim 18, wherein said first and second turning means each comprise a pair of gripping jaws.

20. Apparatus according to claim 18, or 19, and further comprising, displacing means arranged to displace said first and second turning means relative to each other to cause said first and second turning means to bring the groups of each pair of groups to extend in respective planes substantially parallel to each other.

21. Apparatus according to claim 20, and further comprising first and second, other advancing means arranged to advance the groups of each pair of groups in said respective planes out-of-phase with each other past said filling and sealing means.

22. Apparatus according to claim 21, wherein said first and second, other advancing means comprise respective initial pushing means arranged to push the respective groups of each pair of groups away from the respective turning means.

23. Apparatus according to any one of claims 20 to 22, and further comprising transferring means arranged to transfer the groups of each pair of groups from said respective planes to a common plane, and cutting means after said transferring means and arranged to cut-out the containers from the groups of each pair.

24. Apparatus according any one of claims 17 to 23, and further comprising, after said filling and sealing means, rotary transfer means turnable about a substantially horizontal axis for turning the groups from a substantially vertical orientation to a substantially horizontal orientation, forwarding means arranged to forward the groups substantially horizontally from said rotary transfer means, and a cutting station wherein the containers are cut-out and to which said forwarding means advances the groups.

25. Apparatus according to claim 24, wherein said rotary transfer means comprises a plurality of slots equi-angularly distributed round said substantially horizontal axis and extending in radial planes of that axis.

26. Apparatus according to any one of claims 17 to 25, and further comprising between said heat-welding and thermo-forming means, on the one hand, and said turning means, on the other hand, longitudinal severing means arranged to sever said strips along a line extending longitudinally of said strips and between the groups of each pair of groups.

27. Apparatus according to any one of claims 17 to 26, and further comprising releasable clamping means arranged releasably to clamp sheet material at edge zones of the groups, deformable means of said clamping means, fluid-displacing means arranged to displace operating fluid at said deformable means and thereby to deform said deformable means, and driving means arranged to advance said clamping means.

28. Apparatus according to claim 27, wherein said clamping means further comprises a rigid part driven by said deformable means for bearing on said sheet material.

29. Apparatus according to claim 27, or 28, wherein said clamping means is included in cavity means of a clamp body arranged to extend substantially parallelly to said edge zones.

30. Apparatus according to claim 29, wherein said clamp body comprises an opening extending along said clamp body and serving to receive said edge zones to an extent sufficient to allow said clamping means to grip said sheet material.

31. Apparatus according to claim 29 or 30, wherein said clamp body is divided, along a plane substantially parallel to said clamp body, into a first member and a second member arranged to lie on respective opposite sides of said edge zones.

32. Apparatus according to any one of claims 29 to 31, wherein said clamp body is coupled with said driving means for driving said clamp body longitudinally.

33. Apparatus according to any one of claims 27 to 32, wherein said deformable means comprises a tubular element.

34. Apparatus according to claim 33 as appended to claim 29, wherein said tubular element extends longitudinally of said clamp body.

35. Apparatus according to any one of claims 27 to 34, wherein said fluid-displacing means serves to displace said operating fluid into said deformable means to inflate said deformable means.

36. Apparatus according to claim 35, and further comprising a second deformable means of said clamping means and squashable by inflation of the first-mentioned deformable means.

37. Apparatus according to claim 36, wherein said second deformable means comprises a spring.

38. Apparatus according to claim 36 or 37, wherein said second deformable means inflatable and deflatable.

39. Apparatus according to anyone of claims 17 to 38, wherein said heat-welding and thermo-forming means comprises first and second pre-heating stations arranged at substantially the same horizontal level as each other for pre-heating said strips, a shape-initiating station located below said horizontal level for initiating shapes of said containers, first and second mould dies of said shape-initiating station arranged substantially vertically and displaceable rectilinearly and substantially horizontally towards and away from each other, and oscillatory driving means connected to said first and second mould dies and arranged to drive the dies rectilinearly towards and away from each other.

40. A method comprising indexing containers along separate first and second paths substantially parallel to each other past pairs of stations whereof the stations of each pair are associated with the respective paths, in such manner that the indexing of the containers along the first path is out of phase with the indexing of the containers along the second path, characterized by supplying the containers to the paths in the form of units each comprised of a group of the containers anchored to each other and arranged in a row to extend along the path.

41. Apparatus comprising first and second indexing conveyors arranged to index containers along respective separate first

and second paths substantially parallel to each other, pairs of stations whereof the stations of each pair are associated with the respective paths and past which the indexing conveyors advance the containers in such manner that the indexing of the containers along the first path is out of phase with the indexing of the containers along the second path, characterized by supplying means arranged to supply the containers to the paths in the form of units each comprised of a group of the containers anchored to each other and arranged in a row to extend along the path.

42. A method comprising advancing containers along separate first and second paths substantially parallel to each other past pairs of stations whereof the stations of each pair are associated with the respective paths, and thence along a common, third path, characterized by supplying the containers to the first and second paths in the form of units each including a group of the containers anchored to each other, and cutting the containers of each unit from the unit at a cutting station past which the third path extends.

43. Apparatus comprising first and second conveying means arranged to advance containers along separate first and second paths substantially parallel to each other, pairs of stations whereof the stations of each pair are associated with the respective paths and past which the first and second conveying means advance the containers, and third conveying means for receiving the containers from both of the first and second paths and advancing the received containers along a common, third path, characterized by supplying means arranged to supply the containers to the first and second paths in the form of units each including a group of the containers anchored to each other, and a cutting station past which the third path extends and whereat the containers of each unit are cut from the unit.

44. A method comprising providing a slot extending in a first plane, introducing into said slot a sheet material unit so that the unit extends generally in said plane, turning said slot and thus said unit about an axis of turning lying substantially in said plane, said unit then leaving said slot.

45. Apparatus comprising a slot extending in a first plane for receiving a sheet material unit so that the unit extends generally in said plane, turning means arranged to turn said slot and thus said unit about an axis of turning lying substantially in said plane, and removing means arranged to remove said unit from said slot.

46. Apparatus according to claim 45, wherein said slot is one of a plurality of slots equi-angularily distributed round said substantially horizontal axis and extending in radial planes of that axis.

47. Apparatus comprising first and second pre-heating stations arranged at substantially the same horizontal level as each other for pre-heating respective thermplastics strips extending therethrough, a shape-initiating station located below said horizontal level for initiating shapes of containers to be produced from said strips, first and second mould dies of said shape-initiating station displaceable towards and away from each other, and oscillatory driving means connected to said first and second mould dies and arranged to drive the dies rectilinearly towards and away from each other, characterized in that, said dies are arranged substantially vertically and are displaceable rectilinearly and substantially horizontally towards and away from each other, and in that said driving means is arranged to drive the dies rectilinearly towards and away from each other.

48. Clamping apparatus for sheet material, comprising clamping means suitable for clamping an edge part of said material

and releasing said edge part, characterized in that said clamping means comprises comprises deformable means which can be deformed under the action of an operating fluid.

49. Clamping apparatus according to claim 48, wherein said clamping means further comprises a rigid part driven by said deformable means for bearing on said sheet material.

50. Clamping apparatus according to claim 48 or 49, wherein said clamping means is included in cavity means of a clamp body arranged to extend substantially parallelly to said edge part.

51. Clamping apparatus according to claim 50, wherein said clamp body comprises an opening extending along said calmp body serving to receive said edge part to an extent sufficient to allow said clamping means to grip said sheet material.

52. Clamping apparatus according to claim 50 or 51, wherein said clamp body is divided, along a plane substatially parallel to said clamp body, into a first member and a second member arranged to lie at respective opposite sides of said edge part.

53. Clamping apparatus according to any one of claims 48 to 52, wherein said clamp body is coupled with driving means for driving said clamp body longitudinally.

54. Clamping apparatus according to any one of claims 48 to 53, wherein said deformable means comprises at least one tubular element inflatable with said operating fluid.

55. Clamping apparatus according to claim 54 as appended to claim 50, wherein said tubular element extends longitudinally of said clamp body.

56. A method of clamping sheet material at an edge part by clamping means, comprising operating said clamping means, characterized by displacing operating fluid at a deformable means of said clamping means and thereby deforming said deformable means.

57. A method according to claim 56, wherein said operating comprises inflating a first part of said clamping means thereby squashing a second part of said clamping means opposite to said first part.

58. A method according to claim 57, wherein said operating comprises releasing said clamping means by inflating said second part.

59. A method according to claim 57, or 58, wherein said operating comprises releasing said clamping means by deflating said first part.

60. A method according to claim 56, wherein said operating comprises closing said clamping means by inflating opposite deformable parts of said deformable means with said operating fluid.

61. A method according to claim 60, wherein said operating comprises releasing said clamping means by deflating said opposite deformable parts.

62. A method substantially as hereinbefore described with reference to Figure 1, Figure 2, Figure 3, Figure 4, Figure 5, Figure 6, Figure 7, Figure 8, Figure 9, Figure 10, Figure 11, or Figure 12, Figure 13, Figure 14, Figure 15 and Figure 16.

63. Apparatus substantially as hereinbefore described with reference to Figure 1, Figure 2, Figure 3, Figure 4, Figure 5, Figure 6, Figure 7, Figure 8, Figure 9, Figure 10, Figure 11,

or Figure 12, Figure 13, Figure 14, Figure 15 and Figure 16.

64. A clamping apparatus substantially as hereinbefore described with reference to Figure 10, Figure 11, or Figure 12, Figure 13.

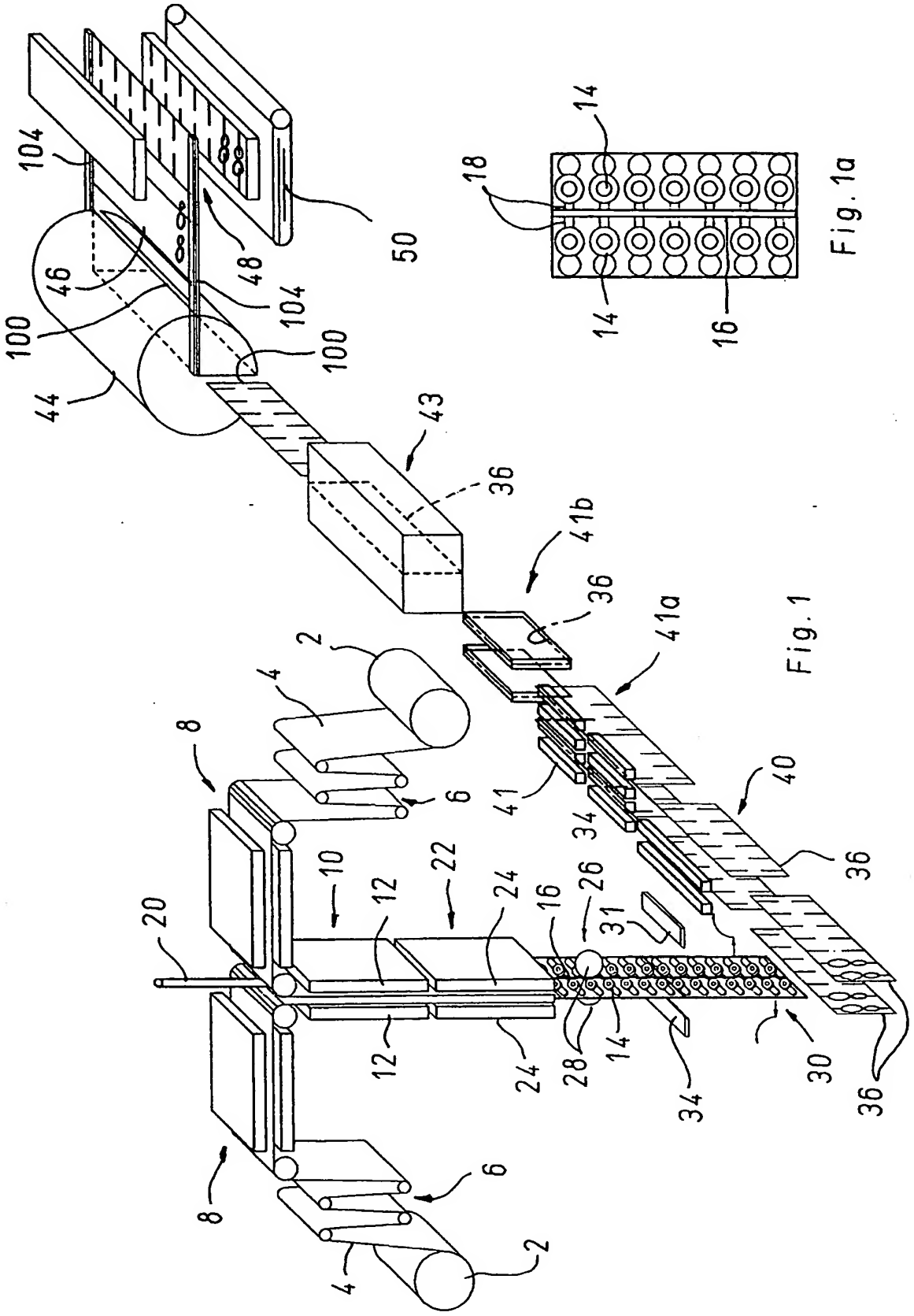

104
46
48
50
100
44
43
36
41b
41a
2
4
8
6
10
12
22
24
16
26
31
20
28
14
34
30
40
41

Fig. 1

18
14
16

Fig. 1a

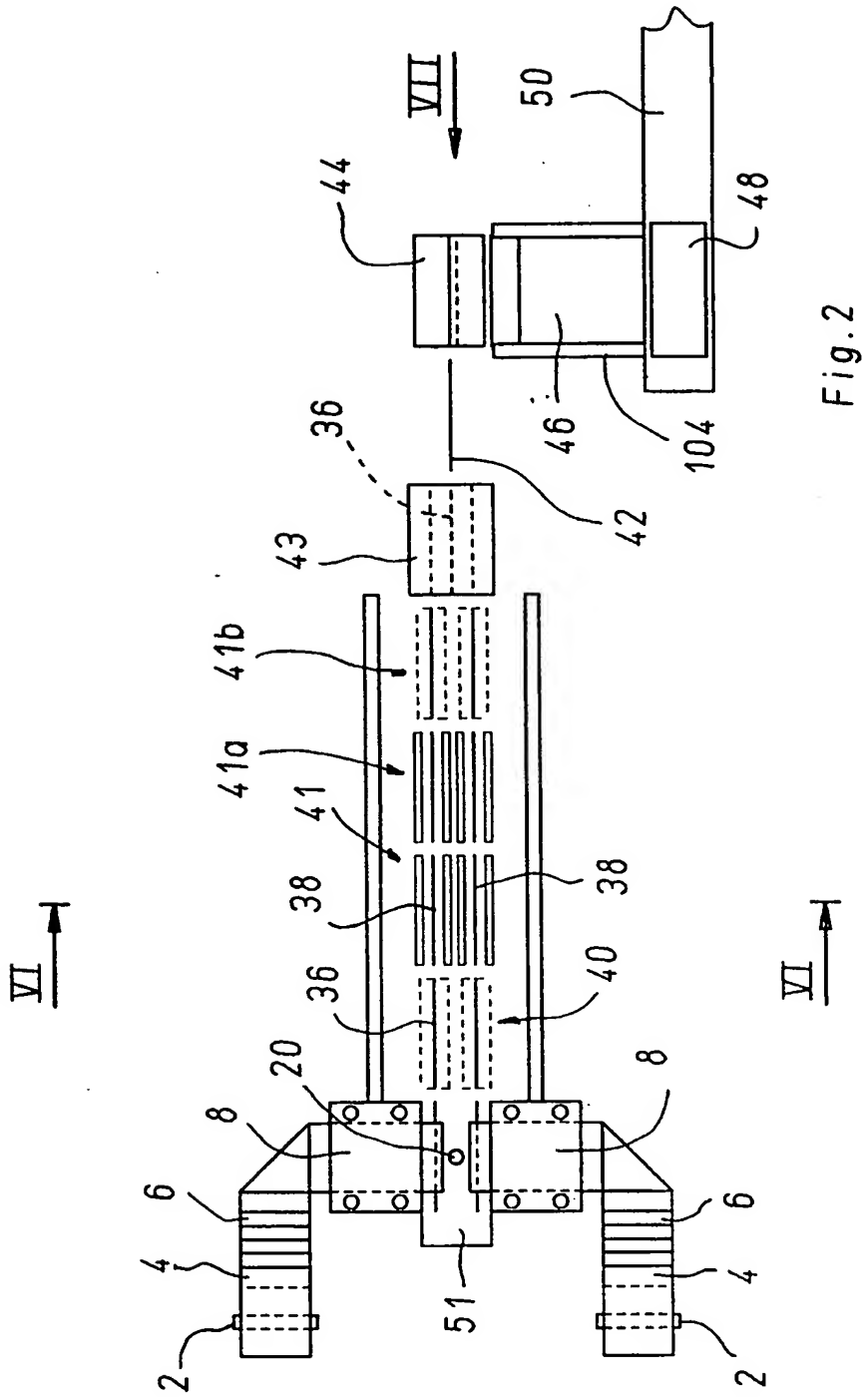

VII
50
44
48
46
104
36
42
43
41b
41a
41
38
38
40
36
20
8
8
6
6
4
4
51
2
2
VI
VI

Fig.2

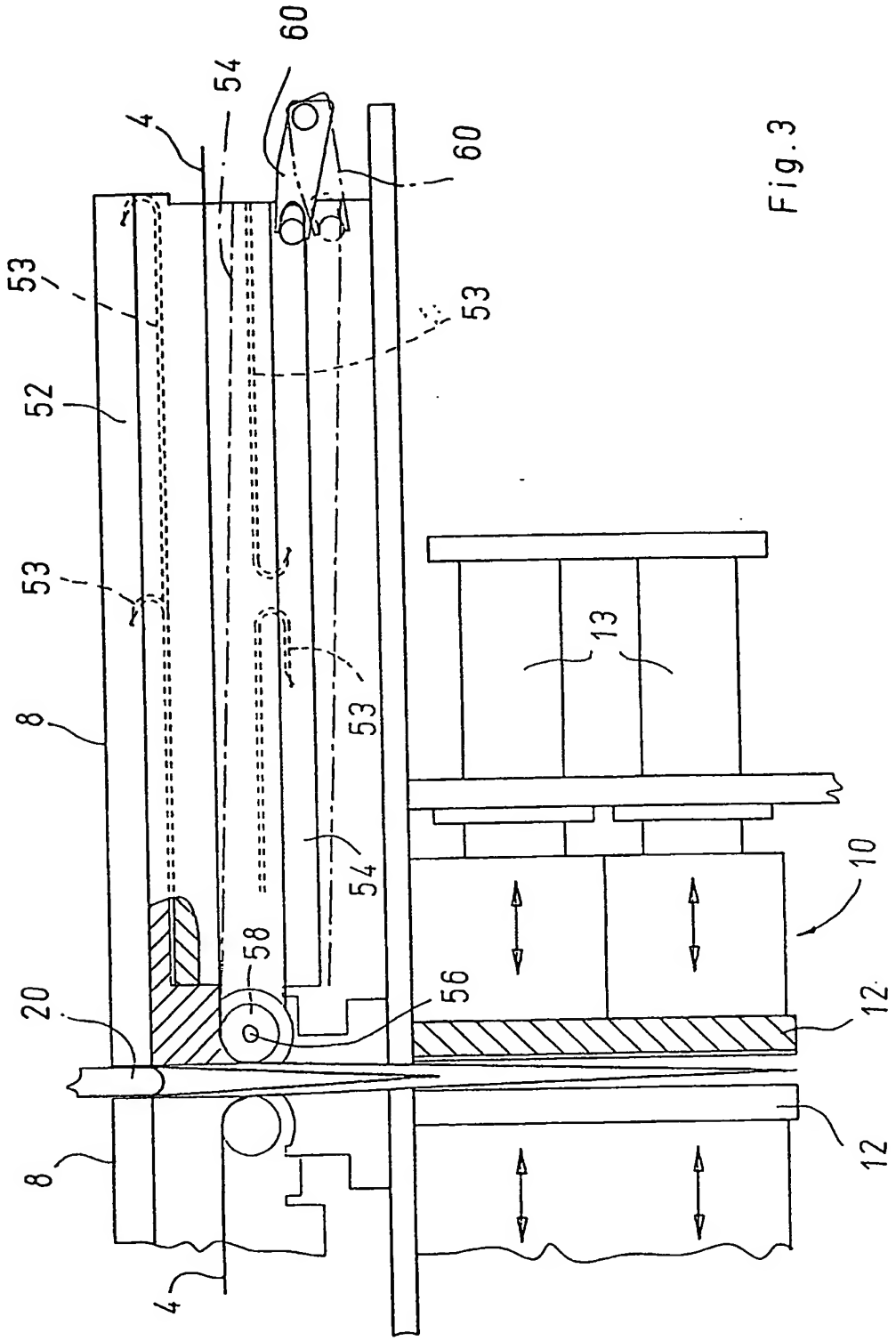


Fig.3

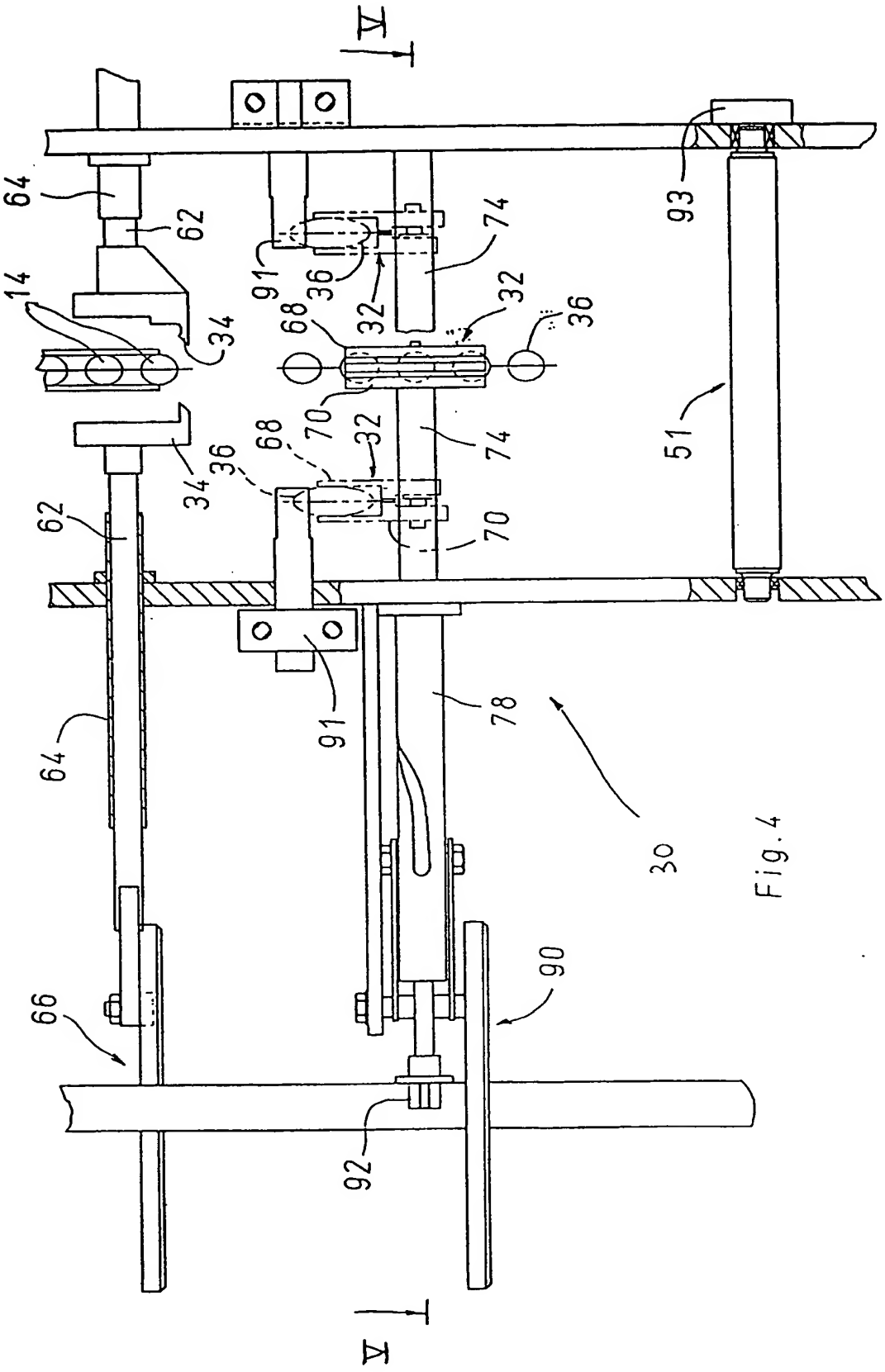

IV
64
62
14
34
91
36
32
68
74
93
32
36
70
51
68
36
34
62
64
91
78
30
66
90
92
IV

Fig. 4

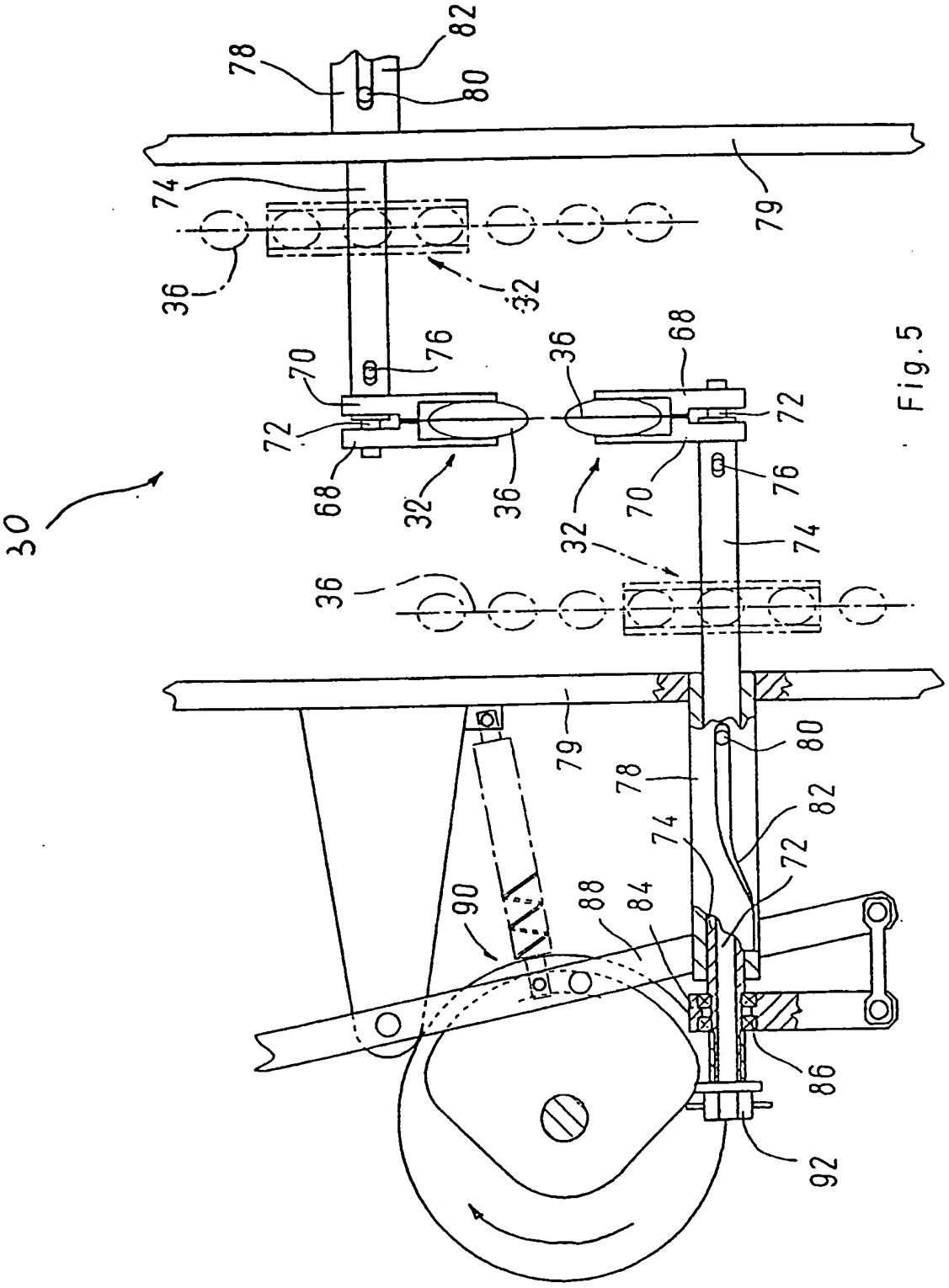


Fig.5

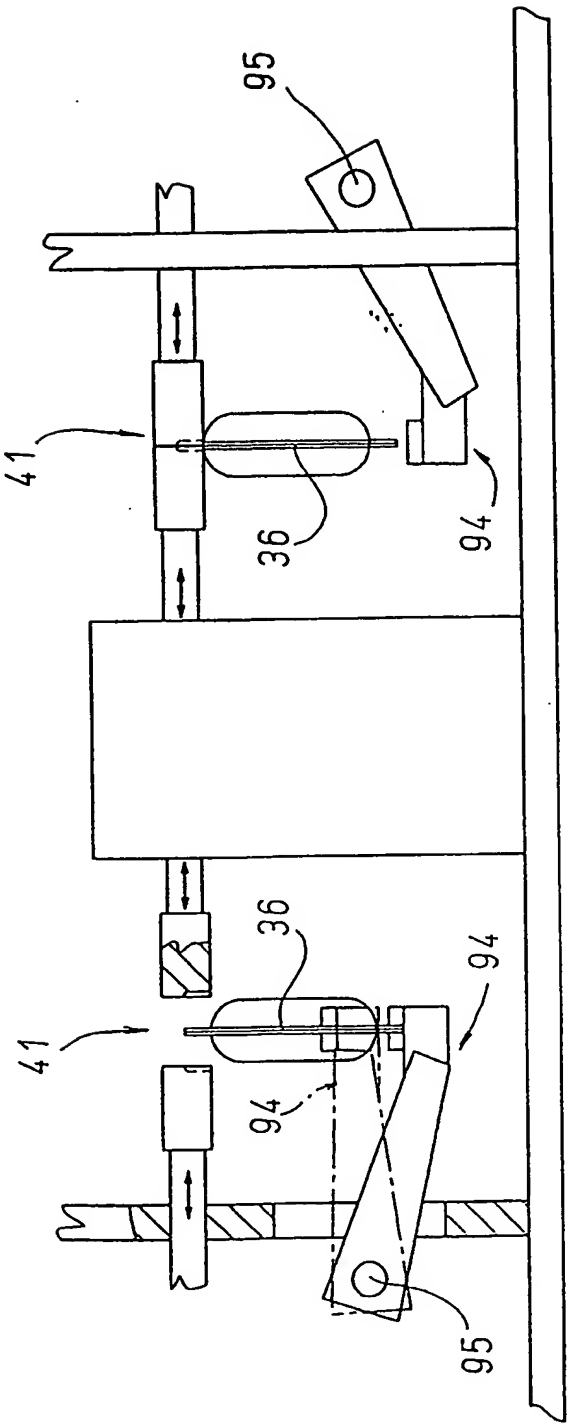


Fig.6

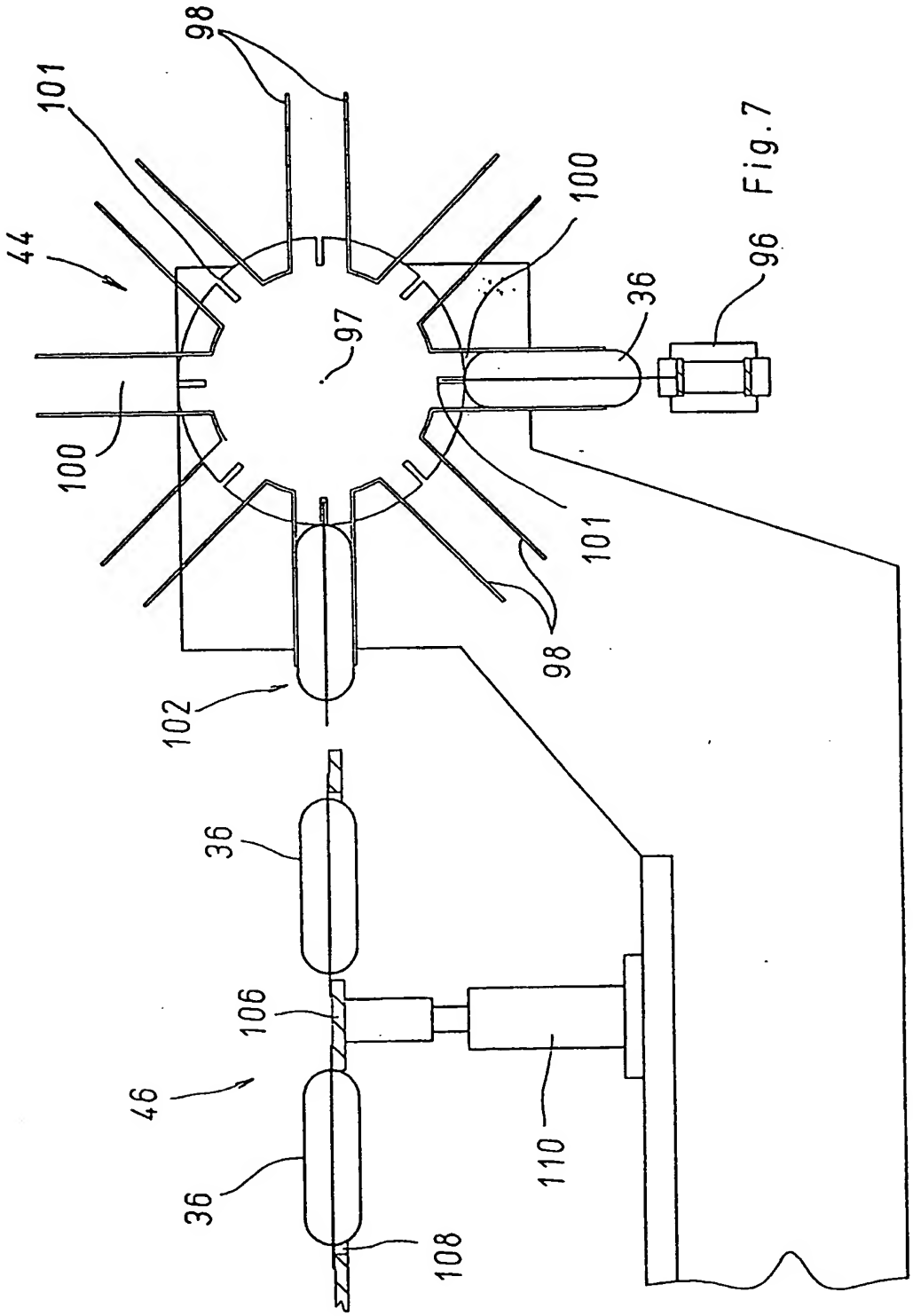


Fig.7

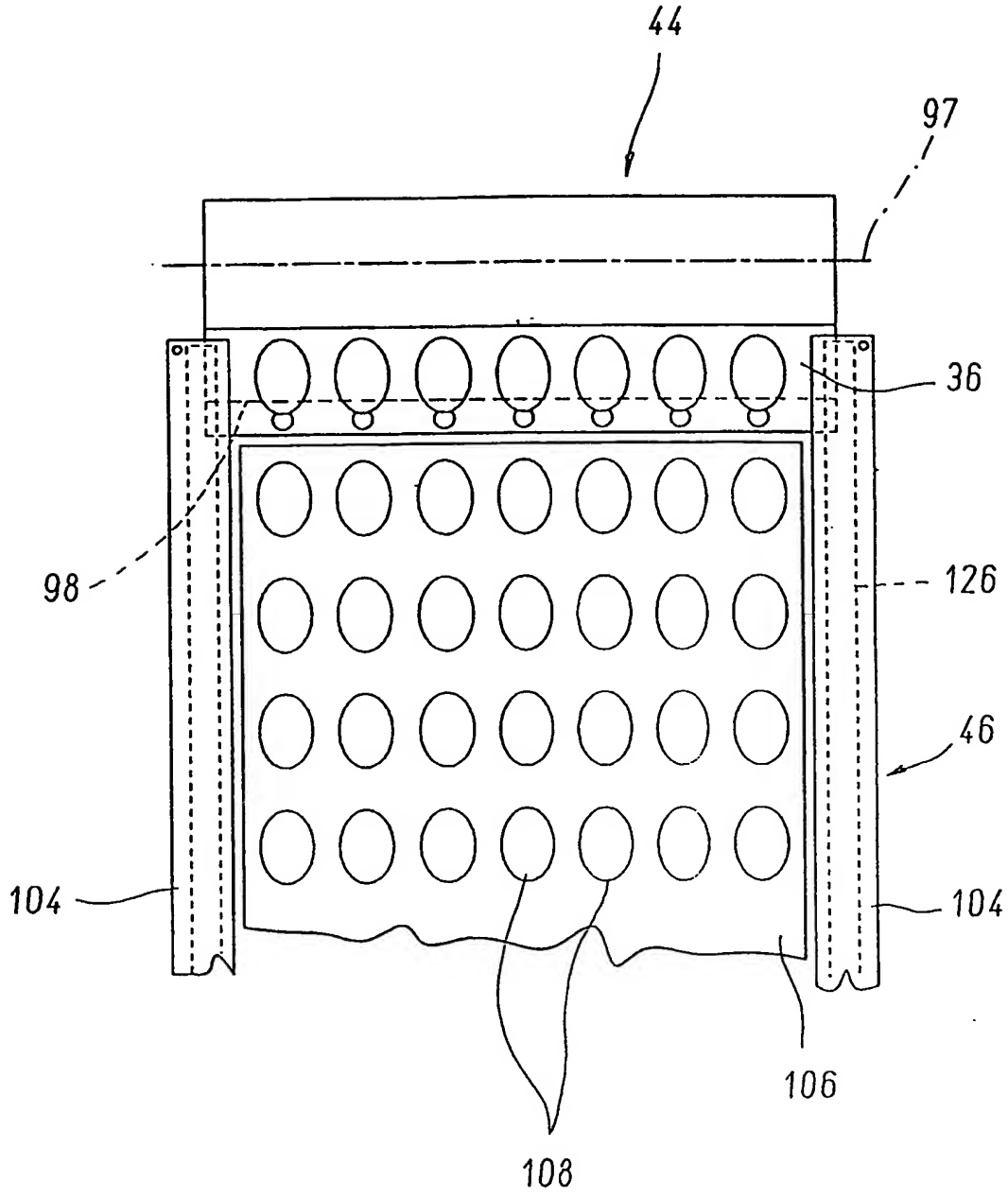


Fig.8

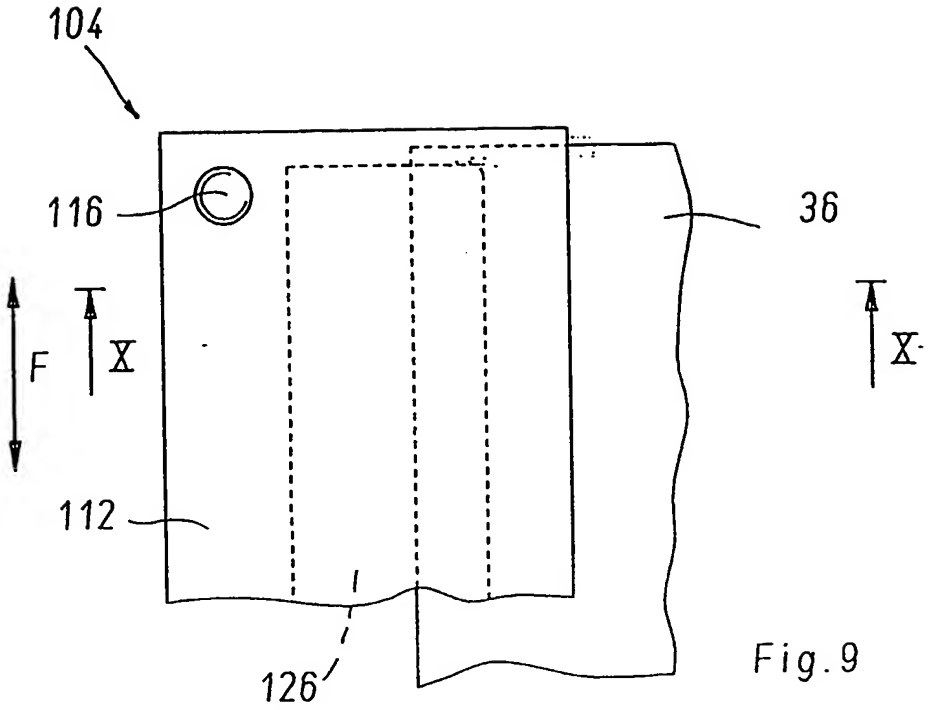

104
116
36
F
X
X
112
126

Fig.9

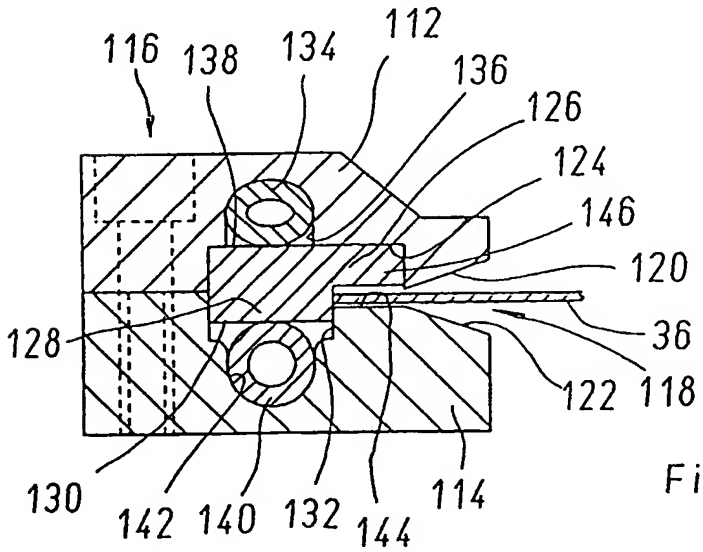

116
138
134
112
136
126
124
146
120
128
36
122
118
130
142
140
132
144
114

Fig.10

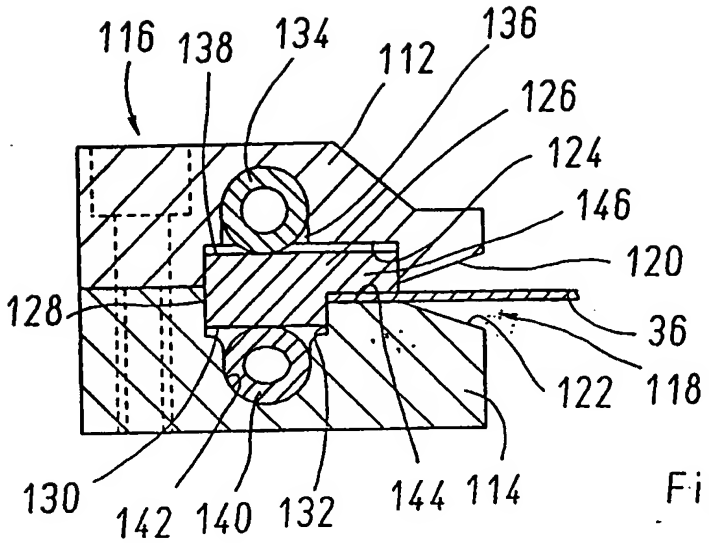


Fig. 11

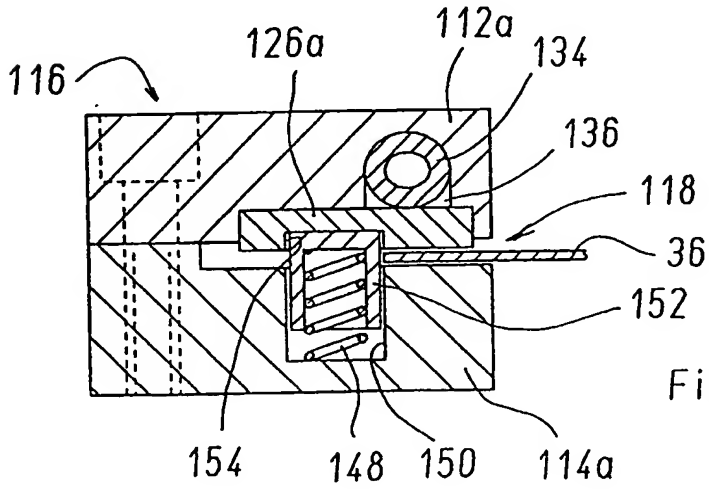


Fig. 12

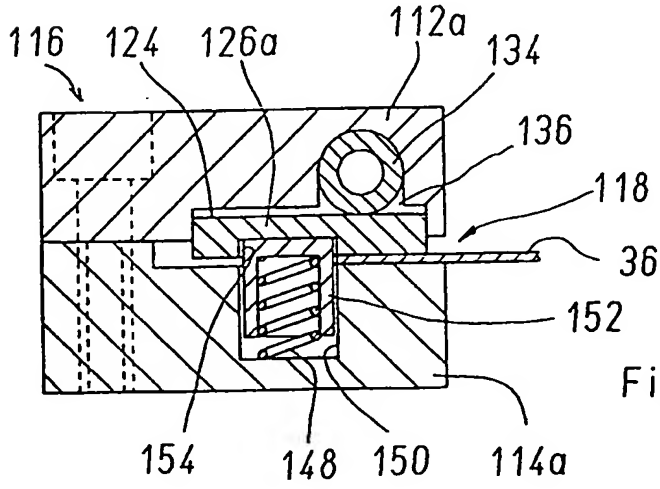


Fig. 13

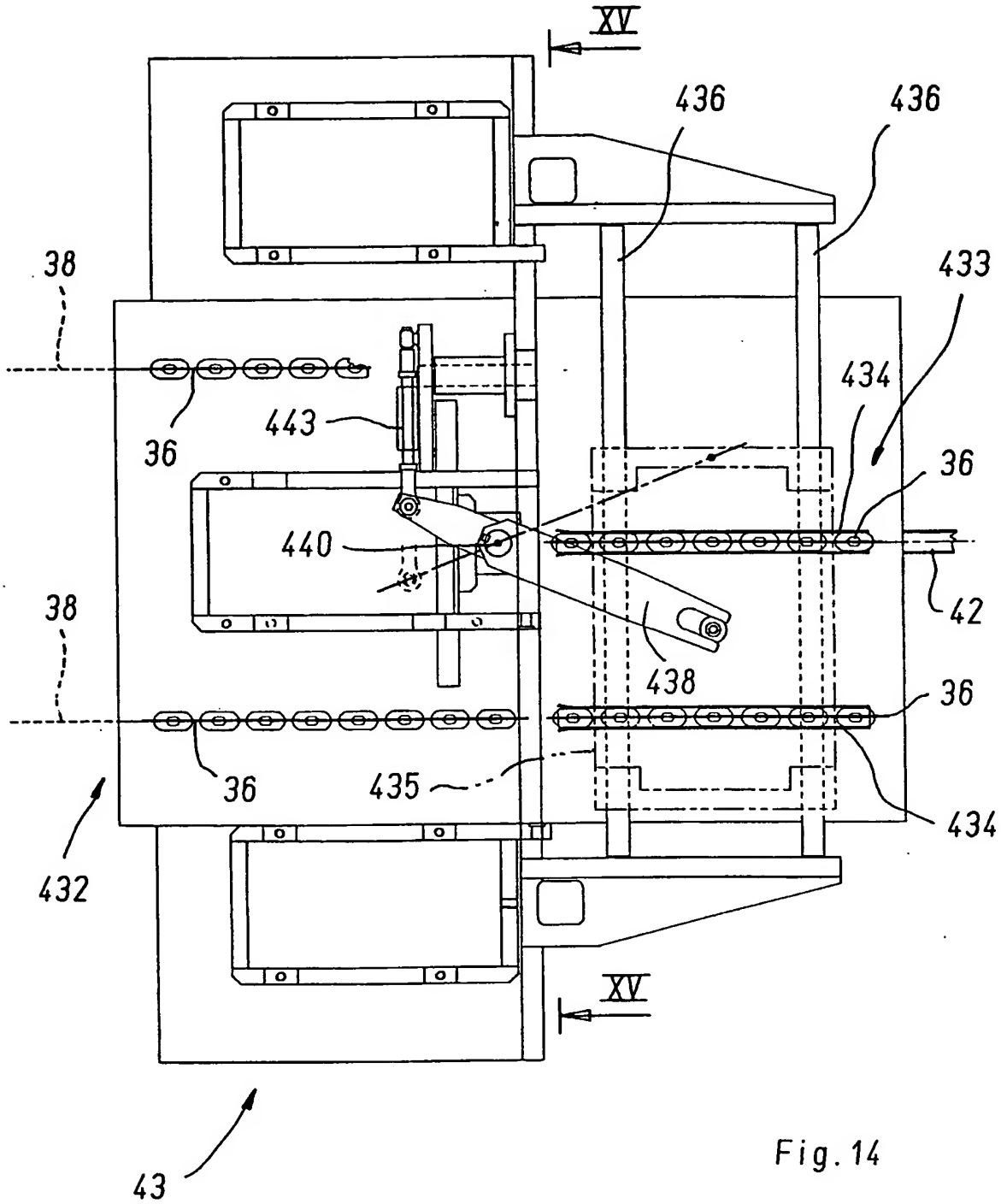
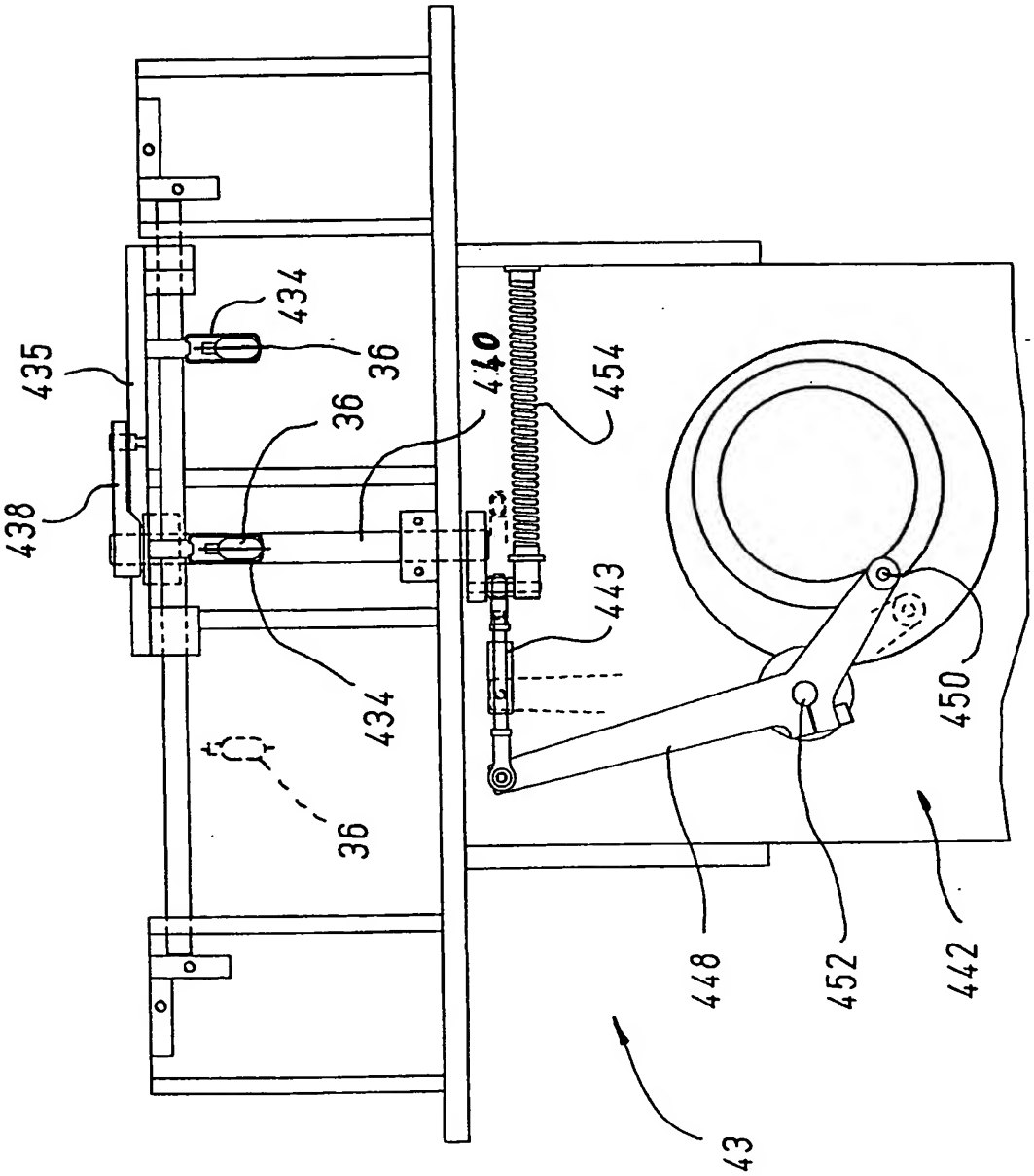

XV
436
436
38
433
434
443
36
36
440
42
38
438
36
36
435
434
432
XV
43

Fig. 14

Fig.15



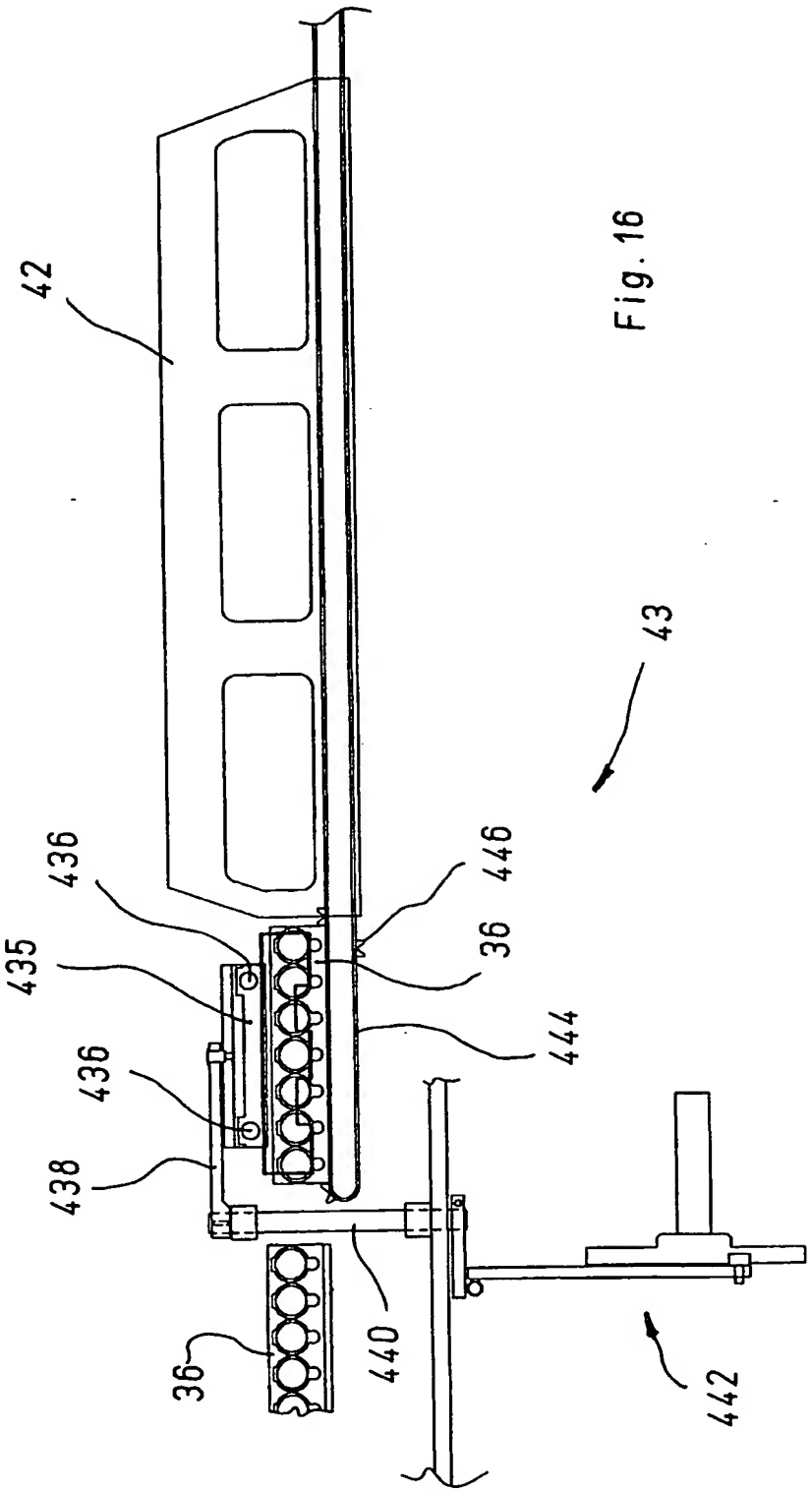


Fig. 16